

Gloriosa superba (L.): A Brief Review of its Phytochemical Properties and Pharmacology

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ABSTRACT

Gloriosa superba (L.) is a perennial creeper in the Liliaceae family and is native to Africa and South-East Asia. *G. superba* is a national flower of Zimbabwe, and jointly it is the state flower of Tamil Nadu state in India. It is widely used as a medicinal plant, and it has two toxic alkaloids namely, Colchicines and Gloriosine are used in the treatment of gout and rheumatism. Similar to many poisonous plants, it has a long history of use in folk medicine and along with several related genera that contain colchicine it has been used to treat. Whole plant of *G. superba* keeps several biological activities such as antioxidant, antibacterial, antimicrobial, and anthelmintic properties. Furthermore, *G. superba* is a good abortifacient and causing expulsion of fetus from the womb. Therefore, based on the aforementioned consideration, this article reviews the most updated information of the phytochemical properties and pharmacological effects of *G. superba* extract, including its miscellaneous uses.

Keywords: *Gloriosa superba*, phytochemistry, antioxidant, anthelmintic, antimicrobial activity.

INTRODUCTION

Medicinal plants have been a rich source of biologically active compounds and play an important role in drug discovery¹. Different parts such as leaf, root, stem, fruit, seed, and bark are used to obtain several phytochemical constituents². Medicinal plants are rich in flavonoids and every group of flavonoids has a capacity to act as antioxidants³. Among them, flavones and catechin components act as the most powerful flavonoids for protecting the body against ROS⁴. The other flavonoid components such as quercetin, kaempferol, myricetin and rutin have antioxidant, anti-inflammatory, antiviral and antiallergic, as well as anticancer activities^{5, 6}. Among Indian ayurvedic herbs, a number of thirty herbs have shown antitumor activities⁷. Currently, natural product researchers have sharper eye on herbal products to obtain medicinally important bioactive compounds. *Gloriosa superba* is often referred to as Malabar glory, and it is a perennial creeper within the Liliaceae family, native to Africa continent and South-East Asia. Glory lily is that the national flower of Zimbabwe, and jointly it is the state flower of Tamil Nadu province in India. Its stem is thin and grows at the rate of twenty feet once a year. Leaves are ovate in shape concerning 6-8 inches long thread like at the apex that helps to climb on the trees. *G. superba* is one of the endangered species among the medicinal plants⁸ and this plant has two toxic alkaloids of colchicine and gloriosine^{9,10}. Colchicine is sometimes used in cytological and plant breeding research for chromosome doubling. Paste of the *G. superba* tuber is externally applied for parasitic skin diseases and also, this plant was used as associate ayurvedic medicinal herb to cure diseases like

inflammatory disease, gout, ulcers, and hemorrhage¹¹. It has also been used to commit murder, suicide, and to induce abortions due to presence of colchicine¹². African porcupines and some moles are reputed to be able to consume the roots with no ill effect¹³. *G. superba* is a good abortifacient and causing expulsion of fetus from the womb. Roots possess purgative, cholagogue, anthelmintic, bitter, acrid, astringent and germicidal properties. Paste is an antidote of snakebite and extract of plant also possess Central Nervous System (CNS) depressant properties^{14, 15}. The tuberous root of *G. superba* boiled with sesame oil is applied twice a day on the joints, affected with arthritis reduces pain¹⁶. *G. superba* is also used in wounds, skin related problems, fever, piles, inflammation, uterine contractions, blood disorders, general body toner and poisoning¹⁷. Based on the abovementioned comments, it is not surprising that the pharmacological benefits of *Gloriosa superba* have been attracting great interest. Therefore, the present review has been detailed updates of the phytochemical and pharmacological properties of *Gloriosa superba* as well as its miscellaneous uses.

Phytochemical properties

G. superba tubers contain colchicines, benzoic and salicylic acid, sterols and resinous substances like as colchicines, 3-demethyl colchicine, 1,2-didemethyl colchicine, 2,3-didemethyl colchicine, N-formyl, N-deacetyl colchicines, colchicocide, gloriosine, tannins and superbine¹⁸. Colchicine is the major compound isolated from the seed and rhizome of this plant¹⁹ and other important compound is gloriosine^{9, 10}. In addition, *G. superba* tubers hold 0.25% colchicine apart from containing sitosterol, glucoside, β -and gamma

Table 1: Reported pharmacological properties of *Gloriosa superba*.

Extract	Parts used	Activity	References
Chloroform and n-butanol	Tubers, leaves, and seeds	Antimicrobial and anticancer	34
Methanolic, aqueous and petroleum ether	Tubers	Antibacterial, antifungal, and mutagenic	27
Acetone	Tubers and stem	Antifungal	29
Alcoholic	Tubers	Antimicrobial	15
Alcoholic	Tubers	Anthelmintic	15
Ethanol and water	Whole plant	Anthelmintic	13
Methanolic	Leaf and stem	Antioxidant and antimicrobial	30
Methanolic	Seeds, tuber, and leaves	Antioxidant	31
Methanolic, acetone, and water	Tubers	Antioxidant	25
Methanol, hexane, and chloroform	Tubers and seeds	Antibacterial	35
Acetone	Tubers and leaves	Antibacterial	36
Alcoholic	Tubers	Antihaemolytic	32
Aqueous	Leaves	Antithrombotic/anticoagulant	33

lumicolichicines, β -sitosterol, flucoside and 2-H-6-MeO benzoic acid and flowers contain luteolin and N-formylde-Me-Colchicine^{20, 21} reported that new colchicine glycoside, 3-O-demethyl colchicine 3-O-alpha-D- glucopyranoside found in *G. superba* seeds.

Polyphenols

Phytochemical analysis of *G. superba* tubers and seed contain total phenolic concentration is 0.975 mg/g and 0.561 mg/g respectively. Total carotenoids concentration was presented in 22.74 mg/100g for tubers and 25.62 mg/100g for seeds. In addition, total ascorbic acid concentration 21.06 mg / 100g and 23.34 mg/ 100g for tubers and seeds respectively, reported by^{22, 23} Observed that *G. superba* seed have the presence of carbohydrates, alkaloids, glycosides, flavanoids, steroids, phenolics and terpenoids. Additionally, *G. superba* leaves exhibited the presence of carbohydrates, alkaloids, flavanoids, steroids and terpenoids. *G. superba* tuber exhibited the presence of carbohydrates, alkaloids and flavonoids, vitamin C, vitamin E, phenols, glycosides, saponins and minerals²³⁻²⁵.²⁶, observed that *G. superba* leaves and tubers exhibited various classes of compounds such as alkaloids, flavonoids, glycosides, saponins, steroids, phenols and tannins. Additionally, those suggested that *G. superba* plant are rich in several biologically active compounds which could serve as potential source of the crude drugs that can be used as a complementary source of traditional medicines.

Pharmacological activities

The different parts of *G. superba* exhibited diverse pharmacological activities and it was summarized in Table 1.

Antimicrobial activity

The phytochemicals from tubers of *G. superba* have with antimicrobial activity of showed a higher activity against the gram negative bacteria, *Escherichia coli*,^{27, 28} reported anti-microbial potential of *G. superba* extracts in which excellent antifungal activity was confirmed against *Candida albicans*, *C. glabrata*, *Trichophyton longifusus*, *Microsporum canis* and *Staphylococcus aureus*. Antimicrobial activity of acetone, ethanol, methanol and

hexane extracts of root and stem from *G. superba* was evaluated and reported that it showed that all the extracts posses antimicrobial activity against *E. coli*, *S. aureus*, *A. niger* and *A. flavus*. However, the acetone extract of the plant showed the highest antifungal activity against *E.coli*²⁹. A significant antimicrobial activity was observed against gram negative bacteria than gram positive bacteria and *C. albicans* a fungal strain was reported in alcoholic extract of *G. superba* tubers¹⁵.

Anthelmintic activity

¹⁵ reported that *G. superba* tubers alcoholic extracts showed good anthelmintic activity against earthworm *Eisonia fatida*. The ethanol and water extract of whole plant of *G. superba* were investigated for activity against Indian earthworms *Pheretima posthuma*. Both extract tested at the dose (20-60 mg mL⁻¹) level produced significant activity (p<0.01) when compared with piperazine citrate (15 mg mL⁻¹) and both extract exhibited considerable anthelmintic activity was reported by¹³.

Antioxidant activity

Methanolic extract of *G. superba* leaf showed significant antioxidant and antibacterial activity, and in additional, it can be exploited as a natural source of antioxidant and antimicrobial was suggested^{30, 31}, reported that methanolic extract of seeds, tubers and leaves of *G. superba* showed antioxidant activity (Table 1).

Other benefits

Alcoholic extracts of *G. superba* showed 90% protection to mice treated with minimum leather dose of venom (LD₉₉) was observed³². Those researchers are reported that *G. superba* (25-100mg/mL) produced significant changes of membrane stabilization of human red blood cells exposed to hyposaline induced haemolysis.³³, reported that *G. superba* leaves extracts exhibited anticoagulant properties by inhibiting thrombin induced clotting, with IC50 value of 2.97 mg/ml.

CONCLUSION

Medicinal plants are natural sources of bioactive compounds to treat life threatening diseases. *G. superba* is an important medicinal plant, used as an antidote for snake

poison, is in demand commercially. The tuber is poisonous, when consumed in high quantities. This plant also considered as colchicine sources for the chemical constituents of medicine industry. Additionally, it would be useful of producing high amount of colchicines for pest control based on natural products. Several studies were reported that *G. superba* to be rich in various biologically active compounds which could serve as potential source of the crude drugs that can be used as a complementary source of traditional medicines.

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